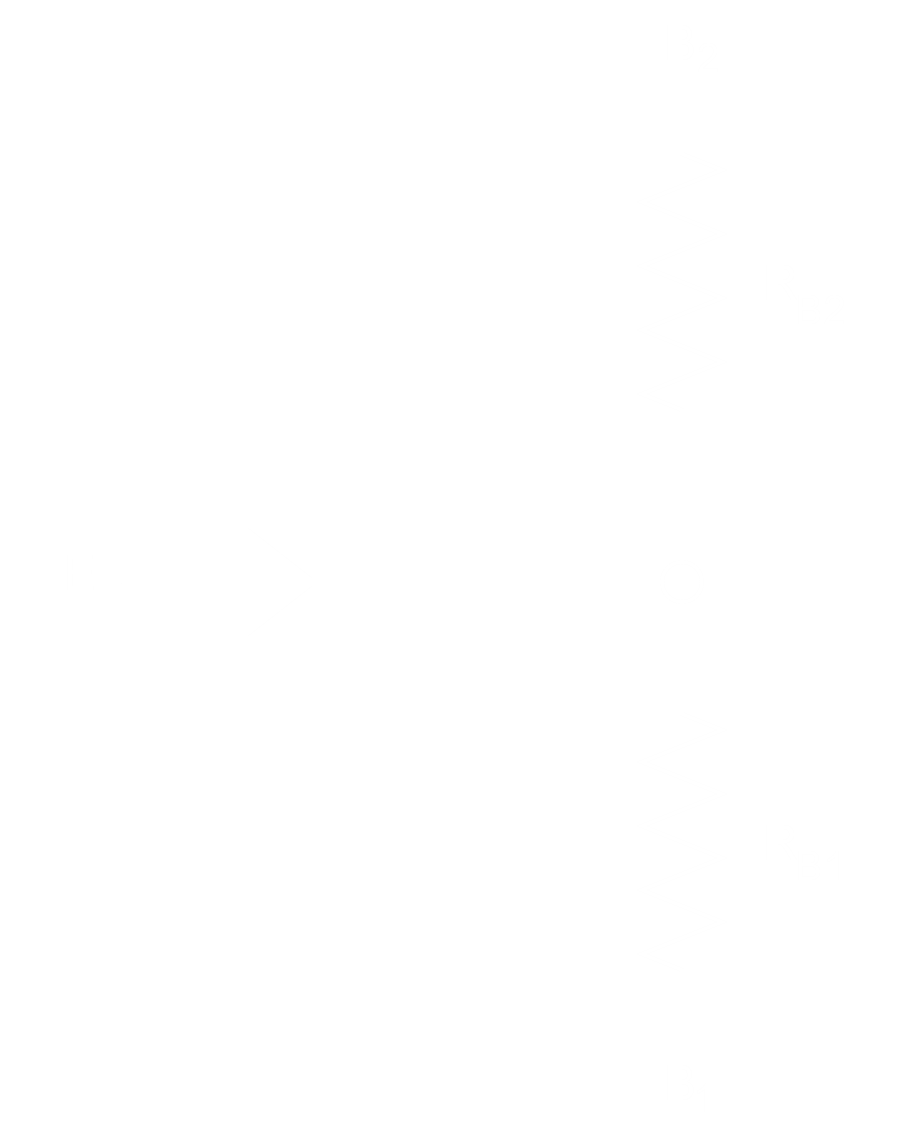
**Questions and Answers**

**Questions (UJT):**

**1. What is an UJT and draw its equivalent circuit?**

A unijunction transistor is a three-lead electronic semiconductor device with only one junction that acts exclusively as an electrically controlled switch.

Equivalent circuit:



**2. Why is an UJT used in SCR firing circuit?**

One typical application of the unijunction transistor circuit is to generate a series of pulses to fire and control a thyristor. By using the UJT as a phase control triggering circuit in conjunction with an SCR or TRIAC, we can adjust the speed of a universal AC or DC motor as shown.

**3. Why is the isolation needed between Thyristor and firing circuit?**

In thyristor converters high ac voltages exists between anode and cathode of the thyristor, while low voltage level pulses are placed between gate and cathode. Isolation is necessary between the gate-cathode circuit and the anode-cathode Circuit so that unwanted short-circuits between devices are avoided.

**4. How is a pulse transformer different from other transformers?**

The pulse transformers can operate at high frequencies, and can transfer more power as compared to a normal transformer of the same size. Pulse transformers are widely used for low power circuits, high power switched mode power supplies, and signal transmission.

A transformer that is enhanced to produce electrical pulses with high velocity, as well as stable amplitude, is known as a pulse transformer.

**5. What are the features of pulse transformer?**

Main features of a pulse transformer are the following ones:

* - primary to secondary turns ratio
* - minimum area (called transfer area) that can be transferred at the secondary side with unipolar pulse, without causing the core saturation, referred to the temperature of
* - primary winding inductance
* - coupling capacity between windings
* - primary leakage inductance, it is the inductance value measured at the primary side, with the secondary winding short-circuited
* - primary winding resistance
* - secondary winding resistance
* - rise time, it is the time that takes to transfer the pulse when the rated load resistance is connected at the secondary side; this value is tightly connected to the leakage inductance value
* - maximum secondary current, available with a rise time equal to (rated load resistance connected to the secondary winding)
* - rated primary effective current (thermal current)
* - rated working frequency (or optimum frequency range)
* - maximum working voltage between two windings
* - isolation voltage between two windings

**6. What are the advantages of using pulse transformer?**

* Ability to Transfer High Energy: High energy can be transferred efficiently with short rise-time and wide pulse-width in a pulse transformer.
* More Windings: With more than two windings, pulse transformers utilize several transistors at the same time.
* Prevents Stray Currents: Pulse transformers have galvanic isolation between the windings, which prevents the passing of stray currents.
* Provides Insulation and Control: Abrasive resins in pulse transformers help control electric resistance or any vibrations inside the transformer with a process known as vacuum potting, which comprises thermo-setting plastics or silicone rubber gel.

**7. What is a firing circuit?**

The triggering circuit is one of the key areas of thyristor or SCR circuit design - ensuring that the silicon-controlled rectifier triggers only when required is key.

**8. What is the load used?**

An electrical load is an electrical component or portion of a circuit that consumes (active) electric power.

**9. What is meant by ramp control, open loop control or manual control with respect to UJT firing circuit?**

Capacitor  Charges through  until it reaches the UJT trigger voltage . The UJT then turns "on" and  discharges through the UJT emitter and primary of the pulse- transformer. The windings of the pulse transformer have pulse voltages at their secondary terminals. Pulses at the two secondary windings feed the same in phase pulse to two SCRs of a full wave circuit. SCR with positive anode voltage would turn ON. Rate of rise of capacitor voltage can be controlled by varying . The firing angle can be controlled up to about . This method of controlling the output power by varying charging resistor R is called as ramp control, open loop control or manual control.

**10. What is time constant of a circuit?**

The RC time constant, also called tau, the time constant (in seconds) of an RC circuit, is equal to the product of the circuit resistance (in ohms) and the circuit capacitance (in farads).

It is the time required to charge the capacitor, through the resistor.

**12. What are the merits of UJT firing circuit over RC triggering circuit?**

UJT circuits used along with the timing RC circuits are used where timing is necessary or where at least 2 waveforms - one a sawtooth waveform with a fast falling edge and a second one with a sharp spike for triggering some other circuit at the exact time point are necessary.

These requirements are simultaneously met directly by using a single UJT firing circuit which is a relaxation oscillator. It can also be synchronized with external signals like the line frequency, a big advantage. Such applications occur in Power Electronic, in firing SCRs and TRIACs and also in some CRO circuits as vertical oscillators.

Whereas a single RC triggering circuit is just a simple basic circuit needing input from other circuit for its working.

**13. What are the advantages of UJT pulse trigger circuit?**

We can get a stable triggering voltage is we use a UJT pulse trigger circuit.

**14. What is relaxation oscillator? Why is UJT used as relaxation oscillator?**

A relaxation oscillator is a nonlinear electronic oscillator circuit that produces a non-sinusoidal repetitive output signal, such as a triangle wave or square wave. The UJT relaxation oscillator is called so because the timing interval is set up by the charging of a capacitor and the timing interval is ceased by the rapid discharge of the same capacitor.

**15. What are the applications of UJT trigger circuits?**

The most common application of a unijunction transistor is as a triggering device for SCR's and TRIACs but other UJT applications include saw-toothed generators, simple oscillators, phase control, and timing circuits.

**16. What is valley voltage?**

As the diode gets forward biased, the voltage across it will be . So, this is constant and  goes on decreasing. Hence  goes on decreasing. It decreases to a least value which may be denoted VV called as Valley voltage.

**17. What is the discharging path of the capacitor?**

The capacitor discharges through the UJT emitter and primary of the pulse-transformer.

**18. Draw the static characteristics of UJT.**

**19. What is negative resistance?**

Negative resistance in a Unijunction Transistor (UJT) is the part of the device’s operating region where emitter current increases as emitter voltage decreases. This is the inverse of what happens with conventional resistance, where increasing current through the resistance causes a linear corresponding increase in the voltage across it (by Ohm’s law, ). Follows is the static-emitter transfer characteristic of a UJT. The region between (, ) and (, ) is where the device effectively acts like a negative resistance.

**20. What is interring base resistance?**

The bulk resistance between the two bases, which will be different for different types of UJT.

**21. What is intrinsic standoff ratio?**

It is the ratio of RB1 to the sum of RB1 and RB2. It can be expressed as or . The typical range of intrinsic standoff ratio is from to .

**22. What is the width of the triggering pulse?**

The time , equal to , when the pulse is applied to SCR for the first time, will remain constant for the same value of . So, the width of the triggering pulse is .

**Questions (Controlled Rectifier):**

**1. What is a full controlled rectifier?**

Phase controlled rectification uses combinations of diodes and thyristors (SCR's) to convert the AC input voltage into a controlled DC output voltage. Fully-controlled rectifiers use four thyristors in their configuration, whereas half-controlled rectifiers use a combination of both thyristors and diodes.

**2. What is a semi converter?**

Semi converter: In the same circuit, 2 thyristors and 2 diodes are used. We can control the voltage during only one half cycle when the thyristors are in forward bias state. The other half cycle it works like a normal full wave converter.

**3. What is a dual converter?**

In a dual converter, two converters are connected together back to back.

One of the bridge works as a rectifier (converts AC to DC), another half bridge works as an inverter (converts DC to AC) and connected commonly to a DC load. Here two conversion processes take place simultaneously, so it is called as a dual converter.

**4. How can we control the output voltage of a single-phase full converter?**

The output voltage can be controlled by the firing angle alpha.

**5. How many lines are there in single-phase system?**

There are two lines in a single-phase system.

**6. What is the type of commutation used?**

The type of commutation used is natural commutation or line commutation. Natural Commutation of SCR is the process of turning off an SCR without using additional commutation circuitry.

**7. What is rectification mode and inversion mode?**

The process through which the AC voltage of the electrical power is converted into a direct (constant) voltage waveform (DC. voltage) or into a pulsating waveform with a direct (DC) component is called rectification

Inversion mode is where the output dc link voltage is negative since the DC link current has to remain positive, the power sent out to the DC link is negative, that means you are actually sending power back to the ac source from the dc link.

**8. Where is full bridge converter used?**

The full bridge converter can be used in the charger of an electric vehicle. It can also be used in the bidirectional converter of renewable energy sources like wind turbines.

**9. What is the effect of adding freewheeling diode?**

It reduces the harmonics and it also reduces sparking and arching across the mechanical switch so that it reduces the voltage spike seen in a inductive load.

**10. Why the brightness of the bulb varies with the variation of the resistance?**

The variation of the resistance varies the charging time of the capacitor which is why the brightness of the bulb changes.